

REMARKS

Response to 35 U.S.C. § 103 Rejections

In the Office Action, the Examiner maintained the rejections of claims 57, 59, 61, 64-73, 113, and 115 as being obvious under the provisions of 35 U.S.C. § 103(a) in view of JP 02-043275, (hereinafter "JP '275" or "the JP '275 publication") in view of Rizika et al., U.S. Patent No. 5,650,213 (hereinafter "Rizika" or "the Rizika patent"). The Examiner also maintained the rejection of claim 62 as being obvious in view of JP '275 and in further view of Yoshida et al, U.S. Patent No. 4,985,484 (hereinafter "Yoshida" or the "Yoshida patent."). The Examiner also maintained the rejections of claims 63, 60, 81-104, 114, and 116 as being obvious in light of JP '275 in view of Rizika and in further view of WO/95/14248. The Examiner also maintained the rejections of claims 117 and 118 as obvious in light of JP '275 in view of Rizika and JP 02300253 (hereinafter "JP '253"). For each of the rejected claims the Examiner combined the teachings of the JP '275 publication and the Rizika patent as part of, or all of the combination of teachings used to reject the Applicant's claims. Applicant respectfully requests reconsideration of these rejections in light of the foregoing amendments to the claims and Applicant's arguments below.

Claims 57, 60, 61, 67, 68, 69, 71-73, 81, 90, 93, 117 and 118 have been amended; claim 91 has been deleted; and new claims 119 to 141 have been added. A set of claims showing the amendments and the new claims are attached.

Claims 71-73 have been amended to correct the typographical error in the preamble of the claims by changing the term "combination" to "composition." Claim 92 has been amended to correct the typographical error by changing "(a)" to "(b)."

Claims 57 and 81 have been amended to recite that the microbeads are metallised and to include a buffer as part of the combination of ingredients forming a retroreflective ink and method for making a one-pack retroreflective ink set as forth in claims 57 and 81, respectively. Support for both of these amendments is found at page 5 of the specification as filed. The metallisation of the microbeads and inclusion of a buffer in the combination of amended claims 57 and 81 provide a long shelf life because the buffer maintains the metal coating on the bead during storage. The inclusion of this combination is not disclosed, taught, or suggested by the references.

One problem associated with retroreflective inks is that the metal coating of the microbeads is easily removed from the microbead when the microbeads are suspended in a water based or other solvent based ink. For example, microbeads coated in aluminum by a conventional method will lose their coating overnight if they are left in distilled water. Accordingly, an ink with a long shelf life requires the retroreflective elements to retain their metallised coatings during storage before use. To achieve this goal, a buffer is included as part of the retroreflective inks. Therefore, the combination of the metallised microbeads and a buffer provide for a retroreflective ink having a long shelf life.

The cited references do not disclose, teach, or suggest retroreflective inks having metallised microbeads and a buffer. In fact, JP '275 does not address the combination of metallised microbeads with a buffer or why the combined components would be desired. Instead, JP '275 simply discloses metallised retroreflective elements combined as part of a non-buffered ink composition. As a result, after a short period of time, i.e., less than 3 months, the reflective elements lose their metal coatings. Therefore, the inks of JP '275 are incapable of providing a long shelf life, e.g., the 3 month period recited in amended claims 57 and 81.

With respect to the Rizika patent, this reference discloses an ink that is used immediately on making; therefore, like JP '275, the loss of metal coating while the bead is suspended in the ink is not addressed in Rizika. As a result, in accordance with the teachings of Rizika, loss of the aluminum on the beads is likely to occur within a short period of time of the beads being suspended in the matrix described in the Rizika patent.

The retroreflective ink according to the present invention includes a formulation to provide that the plurality of ingredients are compatible with each other in order to maintain the consistency of the ink during storage so that the ink is still suitable for printing after prolonged storage and in order to maintain the retroreflectivity of the elements after prolonged storage. This means, for example, that the combination of ingredients must not lead to a thickening of the ink during storage due to a gradual cross-linking of the binder polymer.

For these reasons, Applicant submits that amended claims 57 and 81, and all claims depending therefrom or incorporating the limitations of, are not rendered obvious by JP '275, either alone or in combination with one or more of Rizika, Yoshida, WO/95/14248, or JP '253. Because claims 57 and 81 are independent claims. The recitations of these independent claims are found in each of the other pending claims, and are patentable for the reasons set forth above, all of the claims depending therefrom, or incorporating the limitations of claims 57 or 81, e.g., 59, 59-73, 81-90, 92-104; and 113-116; and 119-141 are also deemed patentable.

Applicant also points out that claim 60, which is dependent on claim 57, has been amended to recite that the binder chemical is a polyvinylidene chloride polymer and that the coupling agent is made up of a mixture of an aminoalkyl silanetriol and a blocked hexamethylene diisocyanate trimer. The combination of these two ingredients as a coupling agent in combination with a polyvinylidene chloride binder is not taught in the prior art. For

example, JP '275 teaches the use of a blocked isocyanate as a coupling agent with a polyurethane binder, however, it does not teach the combination of such a blocked isocyanate with an aminoalkyl silanetriol. In addition, this combination is not disclosed or taught by JP '253 or any of the other references.

It has been found that these mixtures of coupling agents provide a greatly increased wash fastness of the microbeads in the printed and cured ink when combined with a polyvinylidene chloride polymer binder, as compared to the use of a blocked isocyanate coupling agent alone with a polyvinylidene chloride polymer binder. The use of the combination of these ingredients as a coupling agent is not taught in the cited prior art documents. In addition the combination of binder and coupling agent recited in claim 60 provides a retroreflective ink which is fire retardant when applied to a substrate.

The retroreflective ink according to the combination recited in claim 60 includes a formulation to provide that the plurality of ingredients are compatible with each other in order to maintain the consistency of the ink during storage so that the ink is still suitable for printing after prolonged storage. It is submitted that the selection of the coupling agents for the combination of ingredients according to claim 60 includes further inventive activity over the teachings of JP '275, JP '253 and the other references. Accordingly, Applicant submits that the foregoing reasons further support a finding that claim 60 is patentable in addition to the reasons for finding claim 57 patentable.

Claims 61 and 93 have been amended to delete the terms "humectant, urea, urea and 2,3 propane diol" and "buffer, ammonium or sodium phosphate buffer;" although these terms have been included in separate dependent claims discussed below in greater detail.

Claim 67 has been amended to specify that an aluminium coating is superposed on a stannous chloride pre-treatment. Applicant submits that the foregoing reason further supports a finding that claim 67 is patentable in addition to the reasons for finding claim 57 patentable.

Claim 68 has been amended to specify that the microbeads are treated with a solution of a silicate, such as a sodium silicate, followed by treatment with a silane, such as an amino silane. Applicant submits that the foregoing reason further supports a finding that claim 68 is patentable in addition to the reasons for finding claim 57 patentable.

Claims 69 and 90 have been amended to specify that the microbeads are treated with an adhesion promoter such as an amino silane, e.g., bis-*[gamma*-(trimethoxysilyl)propyl]amine. The addition of this treatment provides increased durability to repeated laundering of a printed material onto which the retroreflective ink according to claim 57 or made by the method of claim 81 has been printed and cured. Therefore, the metallised retroreflective elements are given a post-metallising treatment with the adhesion promoter. This treatment must be carefully chosen so as to be compatible with the choice of binder and coupling agent.

The treatment of the metallised beads with an amino silane such as bis-*[gamma*-(trimethoxysilyl)propyl]amine before they are added to the ink results in a printed material derived from the different ink formulations according to claims 57 and 81 which exhibit improved wash fastness of the beads. The use of amino silanes to treat or cover the beads prior to incorporation in the ink is not taught in the cited prior art references. For example, Rizika teaches the use of various adhesion promoters in the coupling agent (see col 8, lines 46 to 65), but does not teach the pre-treatment of the metallised beads, which has been found to be so effective in the retroreflective inks according to claims 68, 69, and 90 of the present invention. Additionally, WO/95/14298 does not teach the use of amino silanes such as a bis-*[gamma*-

(trimethoxysilyl)propyl]amine. Accordingly, Applicant submits that the foregoing reasons further support a finding that claims 68, 69, and 90 are patentable in addition to the reasons for finding claims 57 and 81 patentable.

Claims 117 and 118 have been amended, and new claim 132 added, to specify that the ink has a viscosity of between 10 and 30 Pascal seconds. Previously presented claim 103 also includes this limitation. The viscosity range recited in claims 103, 117, 118, and 132 provide inks especially suitable for screen printing. The range of viscosities from 10 to 30 Pascal seconds contributes to the long shelf of the inks according to the present invention.

If the viscosity is below the lower limit, then the beads tend to settle out of the liquid ink during storage. This becomes more of a problem, the greater the size of bead. Once the beads have settled out of the liquid ink, it becomes very difficult to re-suspend them. If the viscosity is above the upper limit, then the liquid ink remains covering the whole surface of the bead after printing of the ink onto a substrate until the curing stage. If the entire bead is coated, then the retroreflective characteristics of the bead are destroyed, as an air glass interface is required for retroreflective characteristics to result. With liquid ink of a lower viscosity, the liquid ink drains from the upper surface of the bead towards the substrate, after printing and before curing so as to leave the upper surface of the bead uncoated with liquid ink. The desired range of viscosities is not taught in the prior art and contributes to the long shelf lives of the retroreflective inks according to the present invention.

Neither JP '275 nor JP '253 disclose, teach, or suggest an ink having the viscosity range recited in claims 103, 117, 118, and 132 or why the viscosity of the ink is relevant. Nor do any of the other references disclose, teach, or suggest the viscosity range recited in claims 103, 117, 118, and 132 or why the viscosity of the ink is relevant. Accordingly, Applicant submits that the

foregoing reason further supports a finding that claim 103 is patentable in addition to the reasons for finding claims 57 and 81 patentable. Further, Applicant submits that the foregoing reasons support a finding that independent claims 117 and 118 and new dependent claim 132 are patentable.

With respect to the new dependent claims, claims 119-131 depend from claim 57, claim 132 depends from claim 70 (which incorporates the limitations of claims 57), and claims 133-141 depend from claim 81. Claims 119-121 and 133-135 limit the buffer to a phosphate buffer (claims 119 and 133) and, in particular an ammonium phosphate buffer (claims 120 and 134) and a sodium phosphate buffer (claims 121 and 135). For the reasons discussed above, these further limitations provide additional support for a finding of patentability.

New claim 122 recites that the binder is a polyvinylidene chloride copolymer and the coupling agent is an aminoalkyl silanetriol. New claim 123 recites that the binder is an acrylic copolymer and the coupling agent is an aminoalkyl silanetriol. New claim 124 recites that the binder is a polyurethane binder and the coupling agent is a blocker hexamethane diisocyanate trimer. Such coupling agent and binder combinations generate an ink with good wash fastness characteristics and, importantly, are not taught in the references, and in particular, JP '275. Therefore, Applicant submits that new claims 122, 123, and 124 are patentable over the art of record.

New claims 125 and 139 are dependent on claims 57 and 81 respectively and relate to the addition of a non-flammable plastisol. New claims 126 and 140 depend from claims 125 and 139 respectively and specify the non-flammable plastisol is polyvinylidene chloride and new claims 127 and 141 depend from claims 125 and 139 respectively and specify that the non-flammable plastisol is polyvinyl chloride. The addition of a non-flammable plastisol makes the

retroreflective inks fire retardant. None of these materials are disclosed, taught, or suggested in the prior art as being included with the retroreflective inks recited in claims 57 and 81. Accordingly, Applicant submits that the foregoing reason further supports a finding that claims 125-127 and 139-141 are patentable in addition to the reasons for finding claims 57 and 81 patentable.

New claims 128 and 136 are dependent on claims 57 and 81 respectively and relate to the addition of a humectant. New claims 129 and 137 depend from claims 128 and 136 respectively and specify the humectant to be urea and new claims 130 and 138 depend from claims 128 and 136 respectively and specify that the humectant is a combination of urea and 2,3 propane diol. The addition of a humectant prevents drying up of the ink during printing. This is a particular problem for inks containing retroreflective elements, such as microbeads in screen printing. The problem of ink drying in the screen can be acute with a retroreflective ink because of the high proportion of glass beads. It is likely that such drying would be a problem if retroreflective beads were added to a solvent based ink, such as the ink disclosed and taught in JP '275. This issue is not addressed in the cited prior art documents and in particular the humectants specified in new claims 129, 130, 137, and 138 are not specified in the prior art. Accordingly, Applicant submits that the foregoing reason further supports a finding that claims 128-130 and 136-138 are patentable in addition to the reasons for finding claims 57 and 81 patentable.

New claim 128 recites that the retroreflective ink is a one-pack retroreflective ink. The combination of ingredients in claim 57 of the present application is the first which results in such a one pack ink which has a shelf life of at least 3 months. Such a one pack ink is not achieved by the teachings of the cited prior art documents. Accordingly, Applicant submits that the foregoing

reason further supports a finding that claim 128 is patentable in addition to the reasons for finding claims 57 and 81 patentable.

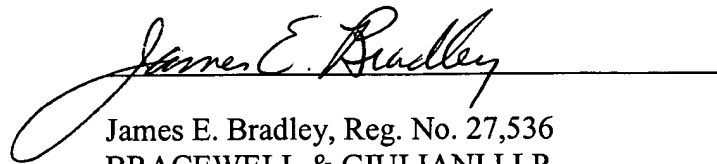
Reconsideration of the application and allowance of all of the claims are respectfully requested. In view of the foregoing amendments, Applicant respectfully submits that all of the claims are allowable, and Applicant respectfully requests the issuance of a Notice of Allowance.

CONCLUSION

In view of the amendments and remarks set forth herein, Applicant respectfully submits that the claims are in condition for examination and the application is in condition for allowance. Accordingly, reconsideration of the application and the issuance of a Notice of Allowance in due course are respectfully requested.

Respectfully submitted,

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A handwritten signature in cursive script, reading "James E. Bradley", is written over a horizontal line.

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